

## **CLAIMS:**

1. A chemical vapor deposition apparatus comprising:

a deposition chamber defined at least in part by chamber walls;

a substrate holder inside the chamber;

at least one process chemical inlet to the chamber positioned over the substrate holder;

at least one purge inlet to the chamber positioned elevationally above the substrate holder and outside a lateral periphery of the substrate holder and configured to inject at least one purge material into the chamber and past the substrate holder.

2. The apparatus of claim 1 wherein, at a point of entry from the purge inlet into the chamber, the purge inlet is comprised by at least one of the chamber walls.

3. The apparatus of claim 2 wherein, at a point of entry from the purge inlet into the chamber, the purge inlet is comprised at least in part by one of the chamber walls comprising a lid.

4. The apparatus of claim 1 wherein the at least one purge inlet is positioned and configured to inject a purge material curtain concentric to the substrate holder.

5. The apparatus of claim 4 wherein the at least one purge inlet comprises a plurality of inlets.

6. The apparatus of claim 1 wherein the process chemical inlet is positioned elevationally above the substrate holder and inside a lateral periphery of the substrate holder and is configured to inject at least one process chemical into the chamber and to a substrate received by the holder.

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7. A chemical vapor deposition apparatus comprising:

a deposition chamber defined at least in part by chamber walls, one of the chamber walls comprising a lid having an outer surface outside the chamber and an inner surface inside the chamber;

a substrate holder inside the chamber;

at least one process chemical inlet to the chamber positioned over the substrate holder; and

at least one purge passageway through the lid from the outer surface to the inner surface, the at least one purge passageway being separate from the at least one process chemical inlet and being configured to inject at least one purge material into the chamber and along at least a portion of the chamber walls.

8. The apparatus of claim 7 wherein the process chemical inlet is configured to inject at least one process chemical into the chamber and to a substrate received by the holder.

9. The apparatus of claim 7 wherein the substrate holder comprises a configuration arranged to receive only a single bulk semiconductor wafer.

10. The apparatus of claim 7 wherein the chamber, substrate holder, and purge passageway have relative positions and geometries configured to direct less than a substantial amount of purge material to a substrate received by the holder.

11. The apparatus of claim 7 wherein the at least one purge passageway comprises a high pressure purge passageway and a separate low pressure purge passageway.

12. The apparatus of claim 7 further comprising a flow director inside the chamber laterally between the at least one purge passageway and the at least one process chemical inlet.

13. The apparatus of claim 12 wherein the flow director comprises a wall concentric to the substrate holder.

14. The apparatus of claim 7 wherein the at least a portion of the chamber walls partially defines a dead space as to material delivered from the process chemical inlet.

15. The apparatus of claim 7 wherein the lid is removable.

16. The apparatus of claim 7 wherein the purge passageway comprises at least one entry port through the outer surface into an enclosed channel laterally around the process chemical inlet and at least one exit port from the enclosed channel through the inner surface.

17. The apparatus of claim 16 wherein at least part of the enclosed channel is annular.

18. The apparatus of claim 16 wherein the exit port comprises a plurality of about equally spaced exit ports forming a ring of exit ports around the substrate holder.

19. The apparatus of claim 16 wherein an intersection of the lid and a second of the chamber walls forms an interior corner of the chamber and a plurality of exit ports are spaced apart from the corner.

20. The apparatus of claim 16 wherein an intersection of the lid and a second of the chamber walls forms an interior corner of the chamber and the at least one exit port is positioned at the corner and defined in part by the second wall.

21. The apparatus of claim 20 wherein the enclosed channel comprises an annular channel having a plurality of enclosed radial channel extensions from the annular channel to one annular exit port.

22. A chemical vapor deposition method comprising:

injecting at least one purge material into a deposition chamber defined at least in part by chamber walls; and

forming a purge curtain from the injected purge material, the purge curtain extending downward from elevationally above a substrate holder and outside a lateral periphery of the substrate holder and the purge curtain flowing past the substrate holder.

23. The method of claim 22 wherein the purge curtain extends from one of the chamber walls comprising a lid.

24. The method of claim 22 wherein the purge curtain is concentric to the substrate holder and flows axially with the substrate holder.

25. The method of claim 22 wherein the purge curtain is annular.

26. The method of claim 22 further comprising:

injecting at least one process chemical into the chamber from elevationally above the substrate holder and inside a lateral periphery of the substrate holder; and

delivering the process chemical to a substrate received by the substrate holder.

27. A deposition method comprising:

injecting at least one deposition precursor into a deposition chamber defined at least in part by chamber walls and comprising a substrate holder inside the chamber, a first of the chamber walls comprising a lid having an outer surface outside the chamber and an inner surface inside the chamber; and

while injecting the precursor, separately injecting a purge material through at least one purge passageway through the lid from the outer surface to the inner surface, the injected purge material flowing along at least a portion of the chamber walls.

28. The method of claim 27 wherein the injecting the purge material further comprises delivering less than a substantial amount of purge material to a substrate received by the substrate holder.

29. The method of claim 27 further comprising forming a curtain from the injected purge material concentric to a second of the chamber walls, the curtain flowing axially with respect to the chamber.

30. The method of claim 27 further comprising forming an annular curtain from the injected purge material.

31. The method of claim 27 wherein the injecting purge material further comprises delivering the purge material through a dead space as to a precursor injected without the purge injection.

32. The method of claim 27 further comprising segregating the purge injection from the substrate holder with a flow director inside the chamber.

33. The method of claim 27 further comprising distributing purge material inside the lid from at least one entry into the lid to a plurality of exits from the lid formed as an about equally spaced ring of exits outside a lateral confine of the substrate holder.

34. The method of claim 27 the injecting the precursor further comprises injecting at least one process chemical into the chamber from elevationally above the substrate holder and inside a lateral periphery of the substrate holder.

35. The method of claim 34 wherein the injecting the precursor further comprises delivering the precursor to a substrate received by the substrate holder.



36. The method of claim 27 wherein the injecting the purge material occurs at a first flow rate while injecting the precursor and further comprising ceasing the precursor injection and substituting the precursor injection for additional purge material injection.

37. The method of claim 36 further comprising, while the precursor injection is ceased, adjusting the first flow rate to a second flow rate different from the first flow rate.

upper portion of the gas flow rate is adjusted to a second flow rate different from the first flow rate.

38. A deposition method comprising:

injecting at least one deposition precursor into a deposition chamber defined at least in part by chamber walls, a first of the chamber walls comprising a lid and the precursor delivery occurring through at least one process chemical port in the lid;

ceasing delivery of the precursor and delivering purge material through at least one process chemical port; and

while delivering the purge material through the process chemical port, separately delivering a purge material through at least one purge port in the lid, the purge delivery occurring along a part of the chamber walls.

39. The method of claim 38 wherein the purge material is not injected through the purge port during the injecting the precursor through the process chemical port.